IS 4278 (1988): Flexible Shafts for Speedometers and Tachographs [PGD 31: Bolts, Nuts and Fasteners Accessories]

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Transmission Devices Sectional Committee. EDC 44: Flexible Shafts Subcommittee. EDC 44 : 8 [Ref : Doc : EDC 44 (3723)]

Indian Standard

SPECIFICATION FOR FLEXIBLE SHAFTS FOR SPEEDOMETERS AND TACHOGRAPHS

(Second Revision)

1. Scope — Covers the dimensions and performance test for speedometer, rpm/h meter and tachograph flexible shafts (cables) used in automotive applications.

2. Terminology

2.1 *Inner Cable* — The bare working element without end fittings.

2.2 *Inner Cable Ends* — Integral parts attached to/formed at the ends of inner cable for connecting the speedometer to the driving element at the other end.

2.3 *Cable Casing* — A flexible covering in the form of a tube which acts as a run way or guide for the inner cable, protects it from dirt and injury and assists in retaining the lubricant.

2.4 *Cable Casing End Fittings* — Parts used for fastening to the ends of the cable casing by means of which the cable casing is connected to the speedometer and the fixed casing of the driving elements.

2.5 *Speedometer Cable Assembly* — Combination of inner cable, cable casing and casing and inner cable end fittings.

2.6 *Lay of the Speedometer Cable* — The pitch direction of the outer layer of the inner cable. Depending upon the direction of the lay, cables may be specified as left (L) or right lay (R).

2.7 *Direction of Rotation of the Speedometer Cables*

2.7.1 *Clockwise rotating cables* — An inner cable where the wires of its outermost layer tend to close (tighten) when an anti-clockwise torque is applied, viewing from the driving ends.

2.7.2 *Anti-clockwise rotating cables* — An inner cable where the wires of its outermost layer tend to close (tighten) when a clockwise torque is applied, viewing from the driving ends.

3. Types — The speedometer cable assembly shall be of the seven types A, B, C, D, E, F and G depending upon the type of cable ends at the instrument side and the driving element side.

4. Dimensions

4.1 *Speedometer Cable Assembly, Type* A — As shown in Fig. 1.

4.2 *Speedometer Cable Assembly, Type* B — As shown in Fig. 2.

4.3 *Speedometer Cable Assembly, Type* C — As shown in Fig. 3.

4.4 *Speedometer Cable Assembly, Type* D — As shown in Fig. 4.

4.5 *Speedometer Cable Assembly, Type* E — As shown in Fig. 5.

4.6 *Speedometer Cable Assembly, Type* F — As shown in Fig. 6.

4.7 *Speedometer Cable Assembly, Type* G — As shown in Fig. 7.

4.8 *Cap Nuts for Different End Fittings* — As shown in Fig. 8, the dimensions of other types (shapes) of cap nuts and end fittings when used shall be as agreed to between the supplier and the purchaser.

Adopted 8 September 1988

Gr 3

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4.9 *Bending Radius* — The minimum bending radius of speedometer cable in the working position shall be as given below:

Diameter of Inner Cable mm	*Minimum Bending Radius, R* mm
Up to 3·2	100
Above 3·2 and up to 4·2	120
Above 4·2 and up to 5	160
Above 5 and up to 6	200
Above 6	300

4.10 Countersunk should be provided on the ferrule sliding hole of the nut (on thread side) to facilitate proper face seating of the nut on the ferrule flange.

4.11 To adjust the longitudinal play, washers can be provided on both sides as agreed between the purchaser and the supplier.

5. Designation — A speedometer cable assembly of Type A having left lay (L) of the outer layer of the cable and the length of cable 520 mm (to be specified by the purchaser in his order) shall be designated as:

Speedometer Cable A-L, 520 IS : 4278

6. General Requirements — The mechanical properties of cap nuts manufactured from steel shall conform to property class 6 as specified in IS : 1367 (Part 6)-1980 'Technical supply conditions for threaded steel fasteners: Part 6 Mechanical properties and test methods for nuts with specified proof loads (*second revision*)'. When brass or aluminium alloy is used for the manufacture of cap nuts, the material shall have a minimum tensile strength of 300 MN/m^2 (30 kgf/mm^2).

7. Tests

7.1 *Visual Inspection* (*Completely Assembled Cable*) — The inner cable shall be inspected for kinks, bends and looseness and the coating on the outer casing for cracks and the end connections shall also be inspected visually.

7.1.1 The appropriate instrument (witnout damping spring and pointer) which the cable is supposed to run is fixed on instrument side and the inner cable is rotated by hand near the gear box side. The pointer axle of the instrument should rotate freely.

7.2 *Service Usage Test* — The cable shall be made to pass through different obstructions as shown in Fig. 9. Care shall be taken to see that the cable is bent only according to the minimum radius *R* specified in **4.8**. The instrument side of the cable shall be fixed to a speedometer and the gear box side shall be fixed to a motor. The cable shall be made to run at 1 400 rpm and should not fail before 1 500 hours of running with about 6 to 8 hours of intermittent run daily.

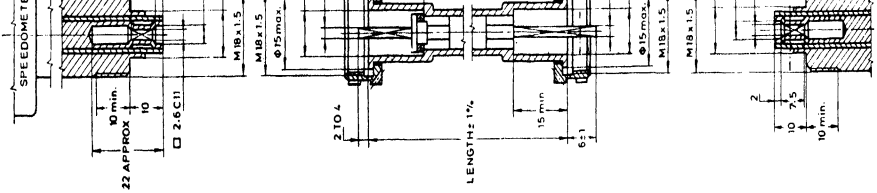
7.3 *Ultimate Breaking Moment Test* (*Inner Cable*) — Inner cable of length 350 to 400 mm is taken and held taut between two collets of the ultimate breaking moment test machine. One of these collets shall be fixed to a pulley of known radius which carries a thread and spring balance as shown in Fig. 10. Load shall be applied to the cable by rotating the pulley along the direction of the outermost layer of the winding. When the inner cable shears, the reading shall be noted on the spring balance. The moment required to break the cable shall be worked out as follows:

Torque = Load × Radius

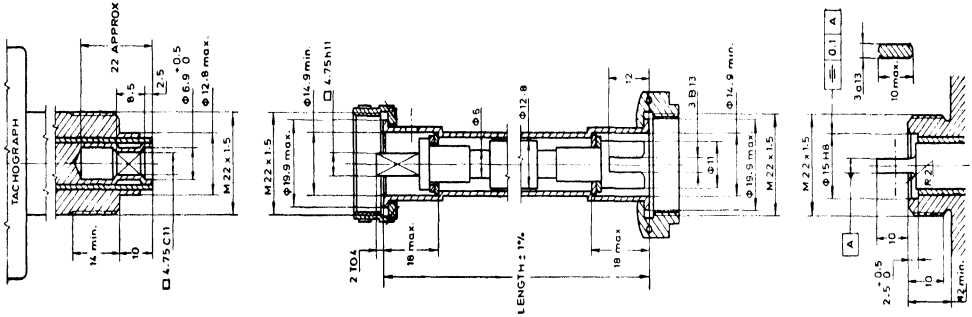
7.3.1 The optimum value of torque for different diameters of cable shall be as agreed to between the manufacturer and the user.

7.4 *Roll Test* (*Inner Cable*) — A length of about one metre is taken, and is laid on the floor in approximately 10 m diameter curve and rolled back and forth from the centre by foot. The cable shall roll smoothly throughout its length without offering resistance and without jerking or flapping about. The extreme ends may flap a little.

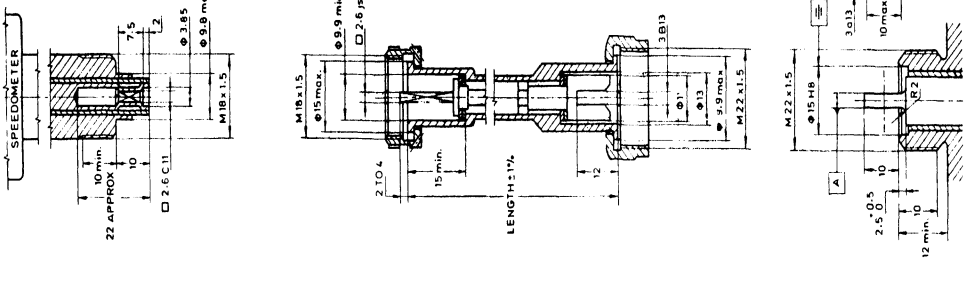
7.5 *Locking Diameter Test* — The speedometer cable assembly is looped and the junction is held in hand. One end of the cable is pulled so as to reduce the diameter of the loop until the cable assembly is felt to offer considerable resistance. The diameter of the loop is then measured and it shall not be more than 20 times the diameter of the inner cable. The loop shall be as nearly circular as possible and there shall not be any obvious difference in the radius of curvature at two adjacent points.



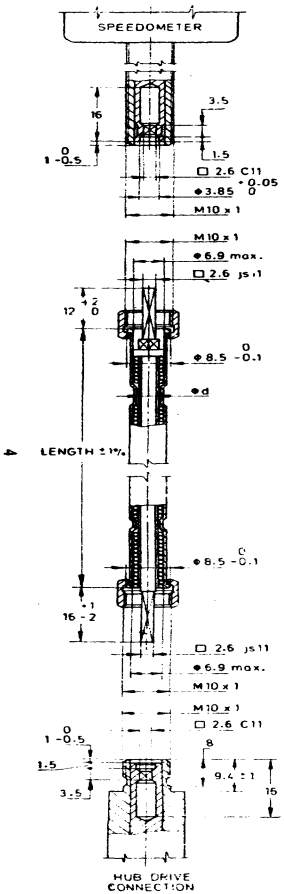
All dimensions in millimetres.
FIG. 1 TYPE A



All dimensions in millimetres.
FIG. 2 TYPE B

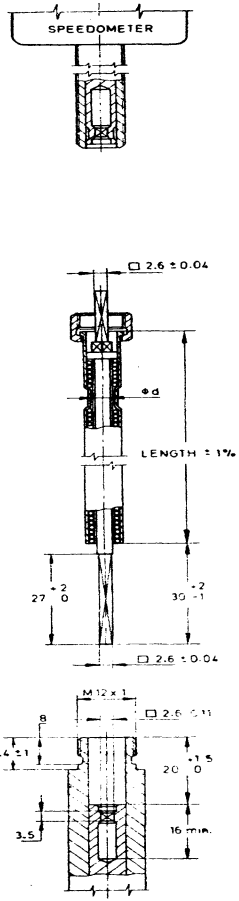


All dimensions in millimetres.
FIG. 3 TYPE C



All dimensions in millimetres.

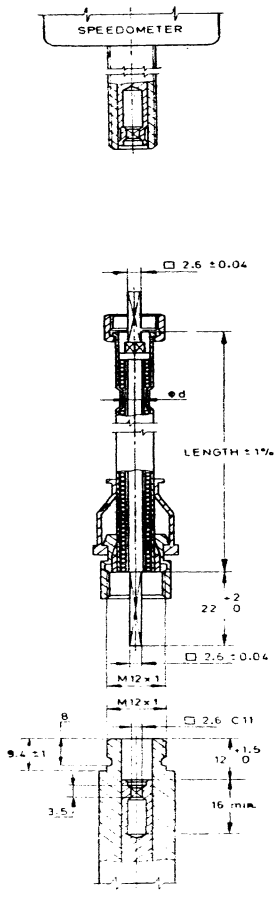
FIG. 4 TYPE D



OTHER DIMENSIONS AS PER TYPE D

All dimensions in millimetres.

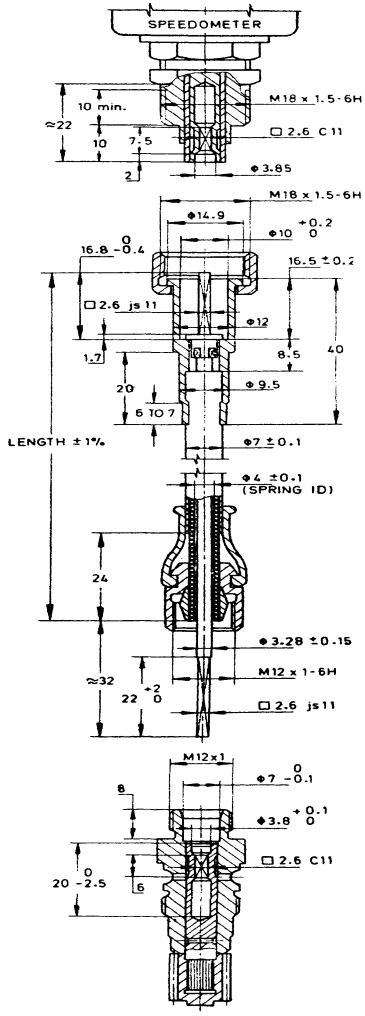
FIG. 5 TYPE E



OTHER DIMENSIONS AS PER TYPE D

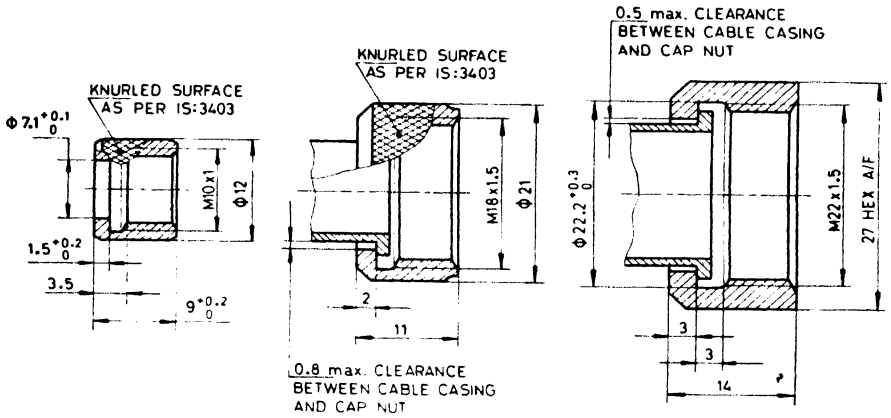
All dimensions in millimetres.

FIG. 6 TYPE F



All dimensions in millimetres.

FIG. 7 TYPE G



All dimensions in millimetres.

FIG. 8 DIMENSIONS FOR CAP NUTS FOR DIFFERENT END FITTINGS

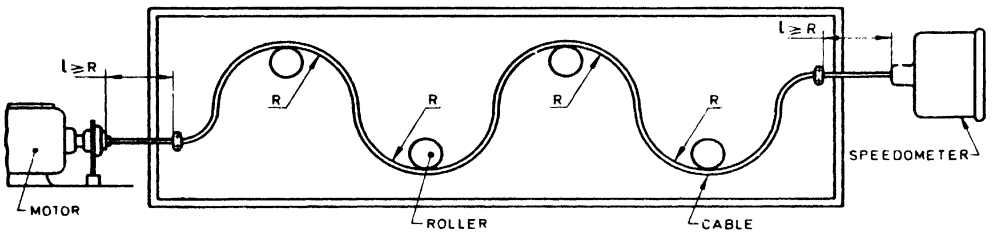


FIG. 9 SERVICE USAGE TEST

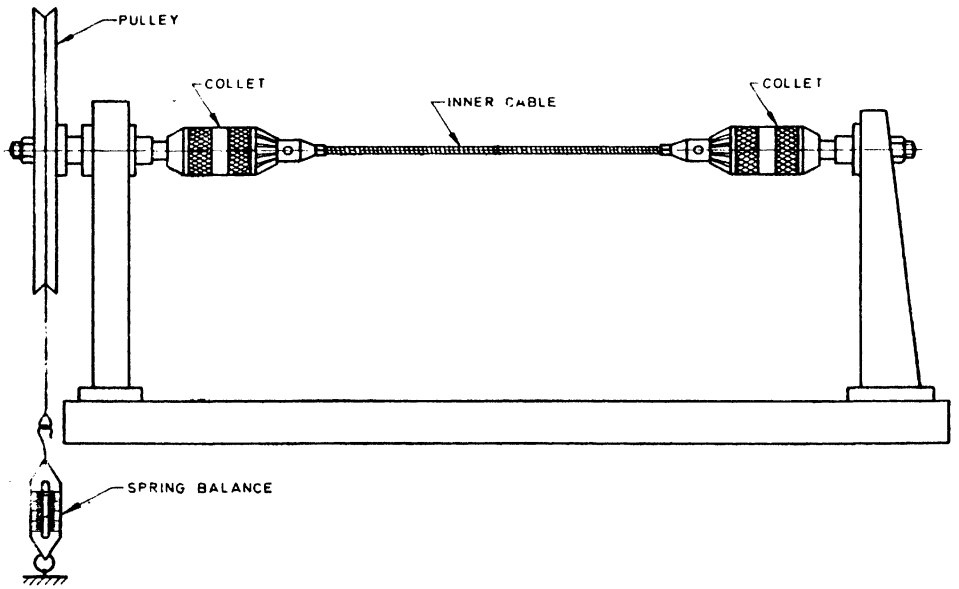


FIG. 10 ULTIMATE BREAKING MOMENT TEST (INNER CABLE)

8. Marking — The cartons or the packages for the cables shall be marked with the following details:

a) Type of cable,
b) Length of cable,
c) Direction of lay, and
d) Manufacturer's name or trade-mark.

8.1 Each cable shall also be marked with the manufacturer's name or trade-mark.

8.2 *Standard Marking* — Details available witn the Bureau of Indian Standards.

EXPLANATORY NOTE

This standard was originally published in 1967 under the title 'Dimensions for speedometer cables' covering the principal dimensions of speedometer cable and the material of the cap nuts. It was revised in 1973 as 'Specification for speedometer cables' and various performance tests were added.

This second revision has been brought out in the light of technical practices prevailing in the country. Title has been aligned with the corresponding Japanese Standard. Seven types of flexible shaft (used in the industry) have been included in place of 4 types included in earlier version and the service usage test has been strengthened by specifying the duration 1 500 h in place of 240 h.

In the preparation of this standard, considerable assistance has been derived from JISD 5602-1983 'Flexible shaft for speedometers and tachographs of automobiles' issued by the Japanese Industrial Standards Committee (JAPAN) and DIN 75532 (Tei12)-1983 'Transmission of rotary motions, flexible drive shafts, issued by the Deustches Institut für Normung (DIN).

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